

# Introduction to ELECTROCOAGULATION

## Kaselco

Presented by  
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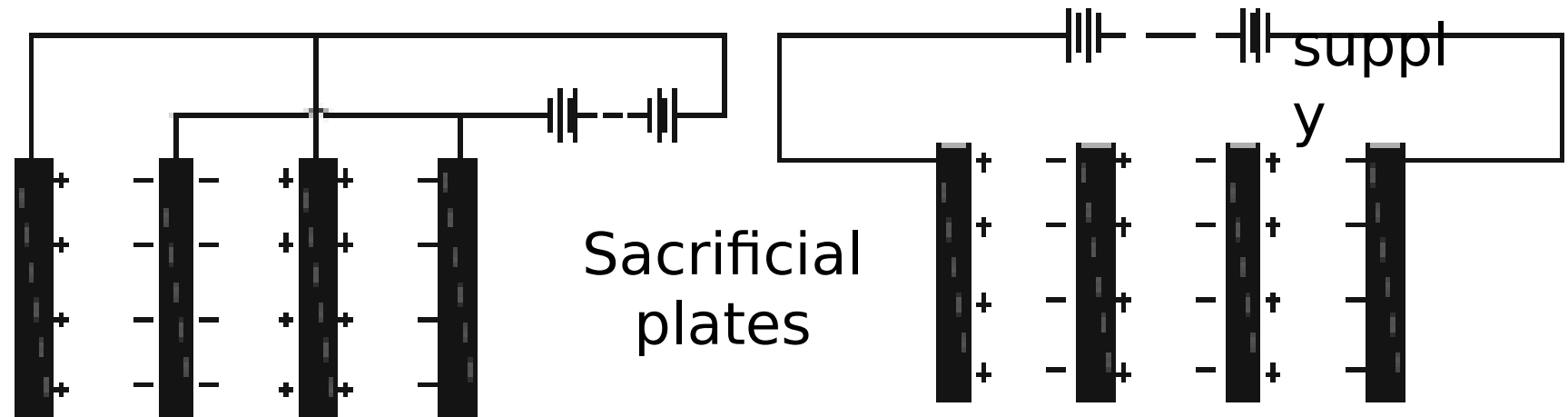
# Overview

- What is electrocoagulation?
- History of electrocoagulation: Old technology with a new beginning at KASELCO
- Why is electrocoagulation important for our future?
- Examples of systems implementing electrocoagulation

# Water treatment approaches

- Physical
- Biological
- Chemical
- Electrochemical

# Electrocoagulation cells



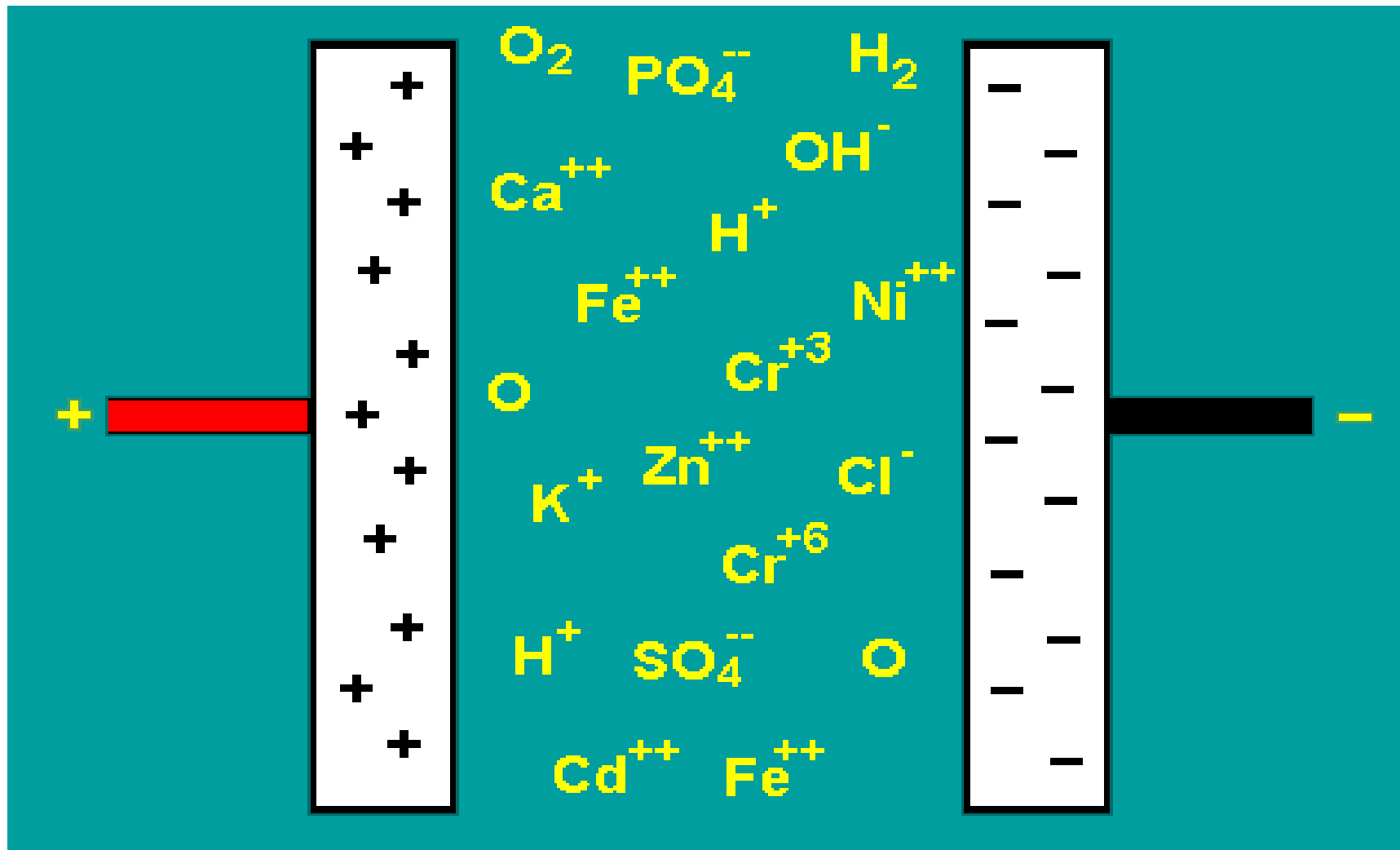
Monopolar connection

Bipolar connection

Huijuan Liu, Xu Zhao, and Jiuhui Qu.  
2010.

Electrocoagulation in Water Treatment

# Ion Reactions



# EC Chemical Reactions

- Metals + Oxygen + Iron
- Hexavalent Chromium + Hydrogen Ion
- pH
- Oils + Oxygen
- Bacteria + Oxygen or Hydroxyl Ion
- Dyes + Hydrogen or Oxygen

# Electrocoagulation History

- 1906 - Dieterich Patent
- Bilge Water Treatment
- 1980's - Revival
- 1988 - Article in *Products Finishing* Magazine
- 1999 - First KASELCO Patent
- 2001 - Second KASELCO Patent
- 2003 - Third KASELCO Patent

# Sur-Flo Reactor Design



# Reactor Sizes & Capacities

- Sur-Flo Reactors

- 2.5 GPM
- 10 GPM
- 25 GPM
- Link Multiple Units (100 GPM)

- Hi-Flo Reactors

- 200 GPM
- 400 GPM
- 600 GPM
- 800 GPM
- 1200 GPM
- 1500 GPM
- Link Multiple Units

# Early KASELCO Unit

(Complete System)



# Facility Installation

(Modular  
Design)



# Mobile Systems



# Why is electrocoagulation important for our future?

- Water reuse
- Dissolved solids become suspended solids
  - Therefore, physical separation is possible
- Limit chemical addition
- Removes a broad spectrum of industrial pollutants

# Present Applications

- Metal Finishing - Plating
- Remediation
- Tannery
- Emulsified Oils
- Bilge Water
- Die Casting
- Truck Wash
- More

# Operating Examples

- Bilge Water with Refinery Water  
Costs Reduced 50%  
Productivity Doubled  
Added 13 Ships  
Eliminated One Shift

# Operating Examples

- Decorative Nickel/Chromium Process
  - Reduced sodium metabisulfite 90%
  - Eliminated Plant Odor
  - Eliminated Health Hazard
  - Reduced Sludge 40%
  - Reduced Treatment Cost 70%
  - Met Discharge Standards

# Operating Examples

- Nickel, Chromium, Zinc, others
  - Reduced Sludge 40%
  - Reduced Chemicals >90%
  - Eliminated 15,000 Kg/yr Salts in River
  - Assured Compliance with Standards

# General Benefits

- Reduced treatment cost
- Reduced chemical usage
- Reduced sludge generation
- Simple operation
- Broad spectrum of treatment
- Cleaner effluent
  - ✓ Less salt in discharge
  - ✓ Lower concentration of contaminants

# Typical Results

| • <b>CONTAMINANT</b>      | <b>INFLUENT mg/l</b> | <b>EFFLUENT mg/l</b> |
|---------------------------|----------------------|----------------------|
| • <b>Oil Pipeline:</b>    |                      |                      |
| □ <b>TPH</b> <b>2,900</b> | <b>31.7</b>          |                      |
| □ <b>Oil and Grease</b>   | <b>2,180</b>         | <b>&lt;5.0</b>       |
| • <b>Bilge Water:</b>     |                      |                      |
| □ <b>Turbidity (FAU)</b>  | <b>455</b>           | <b>12</b>            |
| • <b>Steel Coating:</b>   |                      |                      |
| □ <b>Chromium</b>         | <b>36.63</b>         | <b>&lt;0.005</b>     |
| • <b>Cooling Tower:</b>   |                      |                      |
| □ <b>Copper</b>           | <b>1.96</b>          | <b>&lt;0.005</b>     |
| □ <b>Zinc</b>             |                      | <b>6.921</b>         |
|                           |                      | <b>&lt;0.005</b>     |

# Typical Results

- **CONTAMINANT      INFLUENT mg/l   EFFLUENT mg/l**
- **Die Caster:**
  - **Iron**                      1,520                      1.5
  - **Nickel**                                              >25                      0.12
  - **Zinc**                      12                      <LDL
  - **Manganese**                      200                      <LDL
- **Plater:**
  - **Phosphate**                                              135                      25
  - **Copper**                      14.1                      0.2
  - **Lead**                      377.6                      0.8
  - **Clarity (FAU)**                      2,737                      57

# Diecasting Waste



# Example Applications

- Textile and Other Dyes
- Mixed Metals and Organics
- Oil & Grease
- Bacteria/solids - Sewage Plants
- Arsenic Removal
- Metals in Mine Water
- Plating Operations
- Die Casting
- Wire Drawing Operations

# Summary

- Electrocoagulation is an electrochemical treatment system
- Electrocoagulation: Old technology with a new beginning
- Electrocoagulation is currently treating water at various facilities.
- Electrocoagulation is a part of the water treatment solution, facilitating water reuse

# KASELCO

□ [www.kaselco.com](http://www.kaselco.com)

□ **KASELCO**

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